DOCUMENT RESUME

ED 223 205 IR 010 456

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TITLE The General Impact of the Dwyer Materials on the Acquisition and Retention of Information about the Heart.
PUB DATE May 82
NOTE 10p.; Paper presented at the Annual Meeting of the Association for Educational Communications and Technology, Research and Theory Division (Dallas, TX, May 1982). For other papers, see IR 010 442-487.
PUB TYPE Information Analyses (070) -- Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Audiovisual Aids; *Autoinstructional Aids; College Students; Cues; Higher Education; *Instructional Materials; Media Research; Research Design; *Research Methodology; Retention (Psychology)
IDENTIFIERS *AECT Research and Theory Division Meeting; Color Stimuli; Research Summaries; *Stimulus Characteristics

ABSTRACT

The effectiveness of the Dwyer heart materials in facilitating learning and retention of information related to the heart under normal research conditions was investigated. Previous studies have focused on the manipulation of stimulus dimensions and not the effectiveness of the materials themselves. Data from three previous studies were compared and analyzed: (1) Lamberski's examination of effects of color coding; (2) Jennings's study of cue elaborateness and step size; and (3) Parkhurst's examination of the material's self-pacing nature. Results showed a large difference in pretest and immediate posttest values, indicating that the Dwyer materials were not maximally effective. Groups showed substantial loss between immediate and delayed retention testing. Even at the delayed testing, however, performance was substantially better than at the pretests. Data across the three studies were quite similar. The initial gain and delayed retention demonstrate that the heart instructional booklets are effective, especially under the experimental conditions in which they have been used. Three tables for data comparison and four references are provided. (LMM)

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The General Impact of the Dwyer Materials on the Acquisition and Retention of Information About the Heart

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May 1982

Paper presented as part of a symposium at the annual meeting of the Association for Educational and Communications Technology in Dallas, TX.

IR010456

Introduction

Of all the investigations that have been completed using Dwyer's (1967) materials on the heart, no one has asked the simple question "How effective are the materials for facilitating the acquisition and retention of information and concepts related to the heart?" Certainly, the focus in most of these investigations has been on the manipulation of stimulus dimensions (step size, type of coding, degree of stimulus reality, etc.) and I have no quarrel with that emphasis. However, the extent to which readers can interact with the materials and gain useful information about the heart will - to a certain extent - determine whether stimulus manipulation studies will provide any meaningful results. For example, if students gain nothing or gain everything by working through the materials, then it would be difficult to expect external stimulus gyrations to have any impact. However, if the materials provide some middle ground for gaining information, the manipulation of stimulus dimensions may provide insights into how to improve instruction and hence, strategies for learning. Thus, the basic and simple question addressed in this paper is: "How well do the heart materials work under normal research conditions?"

Data Base

Only one investigator (Lamberski, 1980) has presented pretest data on the criterion tests used with the heart material although that data were used for different purposes. Data came from a pilot study done a term before the main study was completed. Data were considered to be comparable to what would have been found in the main investigation because scores on a physiology pretest (given in both pilot and main studies) were not significantly different. In fact, the means were nearly identical, 22.00 versus 22.03. Data on test performance after having interacted with the material came also from Lamberski (1980) who examined effects of color coding, Jennings (1979) who studied the elaborateness of cues and step size, and Parkhurst (1974) who examined the self pacing nature of the materials. All studies were conducted with college level students, gave the criterion tests immediately after the materials were completed, and finally gave a delayed retention test with the criterion measures after a reasonable length of time (4 to 6 weeks). These similarities in the studies were considered desirable for meaningful comparisons to be made.

Results and Discussion

Table 1 presents descriptive data for the pretests, immediate tests, and delayed retention tests from the three studies. Four points are worth mentioning. First, there is a large difference between the pretest values and the immediate test values. Since criterion tests had approximately 20 items, it also means that the instructional materials were not maximally effective. Second, groups showed substantial loss from the immediate testing to the delayed retention testing. Third, even at the delayed testing though, performance was substantially better than at the pretest. And fourth, data across the three studies are quite similar.

Table 2 presents similar data with values averaged (weighted) across the three studies. In addition, the immediate gain, the delayed gain and the loss are also indicated. On the average, students almost doubled performance from the pretest value and lost about 40 percent of that after four to six weeks. Table 3 presents the results of some significance tests performed on some of the data from Table 2. The first and third columns present t values comparing the difference between pretest and delayed test scores (delayed gain) and between immediate test and delayed test scores (loss). All differences were highly significant. However, due to the fact that some comparisons had very large sample sizes, the denominators in the t tests tended to be very small. To test the same differences under more reasonable sample size conditions, all sample sizes were assumed to be equal to 27, the same as was for the pretest data. These recomputed t values appear in second and fourth (adjusted) columns. Although the t values drop tremendously due to increased error terms, all but one comparison are still significant. The conclusion therefore is that while there was a significant amount of loss over the four to six weeks until the delayed test, delayed test performance was still better than pretest performance which represents scores on the tests without benefit of the heart materials. Considering the fact that the average time spent on interacting with the heart materials was approximately 15 minutes (from Jennings, 14.18; from Lamberski, 16.43), the initial gain and delayed retention seems reasonable evidence that the heart instructional booklets are effective learning materials, especially under the experimental conditions in which they have been used.

References

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Table 1

Descriptive Data for Criterion Tests

Across Three Separate Studies

Criterion Test	Statistic	Pretest	Immediate Retention			Delayed Retention		
		Lamberski (N=27)	Jennings (N=92)	Lamberski (N=176)	Parkhurst (N=332)	Jennings (N=92)	Lamberski (N=176)	Parkhurst (N=301)
Drawing	$\bar{X}$	3.74	13.96	14.09	10.36	9.51	9.09	8.60
	σ	3.44	3.82	4.66	4.48	4.51	4.56	4.32
Identification	$\bar{X}$	7.48	15.18	15.91	13.21	10.95	12.39	11.24
	σ	3.37	3.96	3.64	4.78	4.07	4.18	4.38
Terminology	$\bar{X}$	7.52	13.47	13.29	13.19	9.92	9.96	10.82
	σ	3.36	4.02	4.18	4.21	4.25	4.07	4.02
Comprehension	$\bar{X}$	6.56	12.01	12.75	11.53	9.61	10.28	9.86
	σ	1.99	3.77	4.28	3.84	3.16	3.93	3.64

Table 2

Comparison Between Pretest Data and Combined Studies for Immediate and Delayed Retention

Criterion Test	Statistic	Pretest (N=27)	Immediate Retention (N=600)	Delayed Retention (N=569)	Immediate Gain (IG-P)	Delayed Gain (DR-P)	Loss (IG-DG)
Drawing	$\bar{X}$	3.74	12.01	8.90	8.27	5.16	3.11
	σ	3.44	4.81	4.44			
Identification	$\bar{X}$	7.48	14.30	11.55	6.82	4.07	2.75
	σ	3.37	4.53	4.31			
Terminology	$\bar{X}$	7.52	13.26	10.41	5.74	2.89	2.85
	σ	3.36	4.18	4.12			
Comprehension	$\bar{X}$	6.56	11.96	9.95	5.40	3.39	2.01
	σ	1.99	4.00	3.67			
Summary	$\bar{X}$	6.33	12.88	10.20	6.56	3.88	2.68

Table 3

Statistical Comparisons (t tests)

Due to Learning Materials

Criterion Test	DR-PRE (actual)	DR-PRE (adjusted)	Loss (actual)	Loss (adjusted)
Drawing	7.500	4.773	11.519	2.468[1]
Identification	6.048	3.865	10.618	2.286[1]
Terminology	4.320	2.825	11.728	2.522[1]
Comprehension	8.208	4.222	13.052	1.923[2]

[1] $p < .05$

[2] ns

→ all other t values $p < .01$